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flat, abruptly acute. I have found it rising to the surface in still ponds, in water 4 to 6 feet deep! Sterile plants only seen.

Eastern Mass. Also collected by *L. H. Bailey, Jr.*, in Mich., and *C. Wright*, in Texas.

NAIAS MICRODON, A. Braun.—Sheaths and teeth similar to those of *N. flexilis*, with which it was formerly classed by Braun, except that the teeth are very minute and sometimes very numerous (30–100): leaves less than 1mm. broad, 5 to 8mm. long, somewhat recurved, undulate, not revolute. The species is mainly characterized by its fruit, which is very short (1 to 2mm.), sculptured on the surface by 16 to 26 rows of nearly square reticulations, and scarcely shining. The fruit of *N. flexilis* is $2\frac{1}{2}$ to 3mm. in length, conspicuously smooth and shining, especially in the denuded nutlet, the superficial marking indistinct in mature fruit, but consisting of about 40 rows of roundish-square or irregular shallow reticulations.

Perdinales river, Texas, coll. *Lindheimer*, 1847.

By the courtesy of the curator of the Chapman Herb. at Columbia College, Prof. N. L. Britton, I have been permitted to see the original specimen of Chapman's *N. flexilis*, var. ? *fusiformis*, and I fully agree with Braun that it is *N. microdon*, so that our localities for this species in N. America must include Florida. Our form of the species is classed by Braun as *N. microdon*, var. *Guadalupensis*, it having been originally collected by Duchassaing at the French West India Island Guadeloupe.

Biology of the Conjugatæ.

BY WM. TRELEASE.

The common Brook-Silks (*Spirogyra* and *Zygnema*) have served an excellent purpose in the biological laboratory because of the large size of their cells, and the distinctness with which the parts of the latter stand out; and the completeness of their reproductive processes, which can be followed even by students who have had little training in laboratory manipulations. Yet the details of their vital processes, and even of their structure, are known to comparatively few who use them, and the statements concerning both are scattered through isolated papers, of recent publication, by Strasburger, Schmitz, and others, which are still inaccessible to most teachers. Bringing the most impor-

tant of these facts together, and verifying them by observations on something more than 130 species, has been a task well performed by Professor Gay, of the School of Pharmacy at Montpellier, whose local monograph of the group¹ is a worthy model for monographers elsewhere.

Aside from the behavior of the nucleus in cell-division, which Strasburger has clearly elucidated in his "Zellbildung und Zelltheilung," the most interesting part of their history relates to the structure of their chlorophyll bodies, and to their reproduction.

By allowing the cells to lie for a time in a saturated solution of picric acid, the protoplasm of the well known chromatophores is sufficiently contracted, without distortion, to show its reticulated structure with a high power, and this is rendered still more evident by such contracting reagents as alcohol.

The same treatment brings out the so-called pyrenoids, minute bodies $.5-.15\mu$ in diameter, which their discoverer, Schmitz,² homologizes, rightly or wrongly, with the nucleoli, which divide as the chromatophores enlarge, and whose division precedes that of the chlorophyll bands in which they lie. Their position is indicated, even before they are seen, by the clusters of starch grains which always surround them, and which rarely occur away from them, as though they were instrumental in forming the grains. A good method for the demonstration of the latter is indicated in the employment of acetic acid, in which the cells are placed for a few moments to remove much of the protoplasmic structures, after which they are rinsed in water preparatory to examination.

Containing a nucleus, chromatophores, and pyrenoids, which multiply apparently independently one of the other, the cell is fast losing its claim to recognition as the unit of plant structure.

The family Conjugatæ is of peculiar interest in its bearings on general biology, since in it appears not only sexuality, but the differentiation of the sexes. From plants which are exclusively apogamic (*Gonatonema*, *Spirogyra mirabilis*), a series is traced through the Desmids, where similar vegetative cells conjugate, and the Mesocarpeæ, where, though still similar, their protoplasm undergoes a rearrangement, to the Zygnemaceæ—

¹ Fr. Gay: Essai d'une Monographie locale des Conjuguées. Montpellier. Boehm et Fils, 1884. 8° 110 pp. 4 pl.

² Chromatophoren der Algen.—Verh. naturh. Ver. d. preuss. Rheinl. u. Westf., 1883.

Zygnema, *Spirogyra longa*, *S. inflata*, *S. conspicua*, and *S. punctata*, illustrating an increasing sexual differentiation, that culminates in *Sirogonium sticticum*, in which there is not only a difference between the mother cells of the gametæ, but a difference in size between the latter after their renovation previous to union.

Some New Grasses.

BY GEO. VASEY.

ELYMUS ORCUTTIANUS.—Culms generally several from one root, 2 or 3 feet high, rather slender, leafy; nodes 4 to 5: leaves 8 to 10 inches long, erect but not rigid, narrow and more or less involute when dry, scabrous on the margins, upper leaf equalling or exceeding the culm; sheaths striate, smooth; ligule a short ciliate line or nearly obsolete: spike 4 to 6 inches long, erect, loosely flowered, with 15 to 20 spikelets, two or frequently only one at each joint, mostly flat and 2-ranked: spikelets 5 to 7-flowered; outer glumes linear-lanceolate, rigid, long-pointed, 4 to 6 lines long, one or indistinctly three-nerved, equalling or exceeding the lower flowers; lower flowering glumes 4 to 5 lines long, rigid, lanceolate, acuminate, rounded and smooth on the back, finely punctate, 5-nerved on the inside, the point scabrous; the upper flowering glumes gradually shorter and less pointed, and more scabrous above; palea $\frac{1}{4}$ to $\frac{1}{3}$ shorter than the glumes, 2-toothed at apex, 2-keeled, the keels ciliate.

This is one of those species which may with almost equal propriety be classed in *Elymus* or *Agropyrum*. The narrow rigid glumes, and the general position of the spikelets seem best to refer it to *Elymus*, although in the weaker plants the spikelets are single.

Collected near San Diego, California, by *C. R. Orcutt*.

AGROPYRUM TENERUM.—Culms in tufts or patches, without running rootstocks, apparently annual, about 3 feet high, erect, smooth: leaves narrow, one or two lines wide, 3 to 6 inches long; sheaths striate, smoothish; ligule short: spike slender, cylindrical, 4 to 6 inches long, one or two lines wide, with the spikelets $\frac{1}{3}$ to $\frac{1}{2}$ inch distant, sometimes wider and with the spikelets closer; axis scabrous: spikelets 3 to 5-flowered; outer glumes 5 to 6 lines long, rigid, lanceolate, acute or awn-pointed, strongly 5-nerved; flowering glumes lanceolate, acute, 4 to 5 lines long,